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Asst. Commissioner for Patents
Washington, DC 20231

OFGS File No. : P/3255-43
Inventor : Antoine BASTARD et al
Title : DEVICE FOR ARRESTING THE PROPAGATION OF A BUCKLE IN A DOUBLE-WALLED PIPE
Assignee : COFLEXIP

Enclosed herewith please find the following documents in the above-identified application for United States Letters Patent:

16 Pages of Specification including Abstract and Claims
17 Numbered Claims Calculated as 17 Claims for Fee Purposes
3 Sheets of Drawing Containing Figures 1 to 4.
X Declaration and Power of Attorney
X Priority is Claimed under 35 U.S.C. §119:
Convention Date July 2, 1999 for France Appln. S.N. 99 08 539
Convention Date December 2, 1999 for France Appln. S.N. 99 15 216
X One Certified Priority Application
X PTO-1449 with two International Search Reports and 5 references
X Preliminary Amendment
X Assignment
X Return-Addressed Post Card
OFGS Check No. 94925, which includes the fee of $730.00, calculated as follows:

Basic Filing Fee:	$ 690.00
Additional Filing Fees:	
Total Number of Claims in Excess of 20, times $18:	
Number of Independent Claims in Excess of 3, times $78: . .	
One or More Multiple Dependent Claims: Total $260.	
Total Filing Fees or	690.00
Total Filing Fee Reduced 50% for Small Entity:	
Assignment Recording Fee: $40	40.00
TOTAL Filing Fee and Assignment Recording Fee:	$ 730.00

In the event the actual fee is greater than the payment submitted or is inadvertently not enclosed, or if any additional fee during the prosecution of this case is not paid, the Patent and Trademark Office is authorized to charge the underpayment to Deposit Account No. 15-0700.

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Yvette Carr
Name of Person Mailing Correspondence

Yvette Carr
Signature

June 20, 2000
Date of Signature

Respectfully submitted,

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00458885.1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of
Antoine BASTARD et al
Serial No.:
Filed:

New York, New York
Date: June 20, 2000
Group Art Unit:
Examiner:

For: DEVICE FOR ARRESTING THE PROPAGATION OF A BUCKLE IN A DOUBLE-WALLED PIPE

Hon. Commissioner of Patents
and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Sir:

Prior to examination, please amend the application as follows:

IN THE CLAIMS:

Please amend claims 8 and 10 as follows.

Claim 8, line 1, change "one of claims 2 to 5" to --claim 2--.

Claim 10, line 1, change "one of claims 1 to 3" to --claim 1--;
line 2, delete "or 9".

REMARKS

This Preliminary Amendment is submitted to change the multiple dependent claims to single dependent claims in order to reduce the government filing fee.

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Device for arresting the propagation of a buckle in a double-walled pipe

The present invention relates to a device for arresting the propagation of a buckle in a double-walled pipe which can be wound onto a reel and more particularly in a rigid pipe used for transporting fluids such as hydrocarbons.

A rigid pipe or tube is laid on the seabed usually from a so-called pipelaying vessel. The laying is called S-laying when the pipe adopts the shape of an S between the pipelaying vessel and the seabed and it is called J-laying when the pipe adopts the shape of a J. In the latter case, a guide ramp is provided on the pipelaying vessel, which ramp may sometimes be partially immersed in the water.

The rigid pipe to be laid is stored on the pipelaying vessel either in pipe sections of a given but relatively short length, the pipe sections being joined together as the laying progresses, or it is wound as a great length on a reel, the pipe then being unreeled from the said reel during the laying operation. These laying operations are described in the API (American Petroleum Institute) document "Recommended Practice 17 A from 1987.

When the pipe has left the vessel and while the said pipe is being laid, it is important that the latter undergoes no plastic deformation in bending, which would result in ovalization of the pipe, which ovalization causing a "singular weak point" which would be conducive to the initiation of a collapse. Moreover, when the pipe is laid on the seabed at great water depths (typically greater than 300 m and possibly up to 2000 m and more), the hydrostatic pressure exerted on the pipe may be sufficient to initiate a buckle which has a tendency to propagate along the pipe, in both directions. Of course, the buckle will form preferentially at a "singular weak point" when one exists on the pipe. When the buckle occurs, it is then

necessary to replace at least that section or portion of the pipe comprising the buckled or collapsed region.

To prevent the propagation of a local buckle or buckles, it has been proposed to provide the pipe with certain devices or means, called buckle arrestors.

Such buckle arrestors are described in the US patents No. 2,425,800, 3,747,356, 3,768,269 and 4,364,692.

The process in US 3,747,356 consists in linking a cylinder to a cable, in lodging the cylinder inside a pipe section and then in simultaneously unreeling the pipe and the cable so as to keep the cylinder in the pipe section while the latter is being laid, until the pipe comes into contact with the seabed. The cylinder is then brought back up so as to be lodged in another pipe section to be laid, which is joined to the previous section. Consequently, any buckle likely to occur, when laying the pipe, between the pipelaying vessel and the seabed is immediately arrested and therefore not allowed to propagate along the pipe sections. However, such an arrangement provides no solution or effectiveness for arresting buckles likely to be propagated after the pipe has been finally laid on the seabed.

In US 3,768,269, it is proposed to locally increase the stiffness of the pipe by placing, at regular intervals, for example at intervals ranging between 100 m and 500 m, reinforcing collars whose length ranges between 1 m and 2.5 m. Such a solution is valid only for pipes laid in sections since the reinforcing collars can be mounted and fastened in the factory to the pipe sections and then transported by the pipelaying vessel to the laying site. When the pipe is long and wound onto a storage reel, it then becomes virtually impossible to wind the pipe with its reinforcing collars onto a reel since they would result in straight or almost straight portions that cannot be deformed when winding the pipe onto the storage reel. In order to mitigate this difficulty, it is conceivable

to mount and fasten the reinforcing collars during the laying operations. However, it would then be necessary to interrupt the laying, at regular intervals, so as to mount and fasten the reinforcing collars.

In order to allow the pipe to be wound onto a reel, US 4,364,692 proposes to wind a rod tightly around the pipe so as to form a certain number of turns which can be welded at their ends to the rod itself and/or to the pipe.

According to another embodiment, the turns may be individual turns, by welding their two ends and regularly spacing them apart along that portion of the pipe to be reinforced. As long as the pipe is a single-walled pipe, the increase in the diameter in the reinforced portions may be acceptable. However, when the pipe is of the double-walled or pipe-in-pipe type, that is to say comprising an external pipe or carrier pipe which is slipped over the internal pipe, the increase in the diameter of the carrier pipe is unacceptable when transporting and storing long lengths of pipe of the pipe-in-pipe type.

When the rigid pipe to be laid is manufactured in long lengths on land and then wound onto a reel on the pipelaying vessel, the solutions recommended in the aforementioned documents are not appropriate as they use either long reinforcing collars, having a length of about 1 to 2.5 m, as in US 3,768,209, or the winding of a reinforcing rod around the rigid pipe, as in US 4,364,692.

Another propagation arrestor is described in US 3,860,039 and consists in placing a sleeve over a rigid pipe so as to have a constant outside diameter with a liner. The annular space between the sleeve and the pipe is filled with tar, which transfers the collapse force to the sleeve.

Other end-blocking systems, or bulkheads for double-walled rigid pipes exist and are described especially in WO 96/36831 and WO 98/17940. Such bulkheads cannot be likened to propagation arrestors

since the material from which they are produced is not capable of transferring the stresses applied to the carrier pipe on the internal pipe.

The object of the present invention is to provide a method of producing a device for arresting the propagation of a buckle in a double-walled tube or pipe that can be wound onto a reel placed on a pipelaying vessel or equivalent system, such as a barge, a floating platform, etc.

The subject of the present invention is a method of producing a device for arresting the propagation of a buckle in a rigid pipe comprising an outer wall having a defined external diameter and placed around an inner wall, an annular space being provided between the said outer and inner walls, which method is characterized in that it consists in providing predetermined regions in the said annular space, each predetermined region being bounded between two sealing blocks whose radially opposed faces are in contact with the outer and inner pipes, and in placing a curable compound in each predetermined region, the length of each predetermined region being at least equal to 0.5 times the external diameter of the outer wall.

An advantage of the present invention resides in the fact that the curable compound may be introduced into the annular space of the rigid pipe on land and cured, since the length of each predetermined region which is filled with the cured compound is short enough to allow the rigid pipe to be wound, onto a reel for example. The length dimension is regarded as being axial, that is to say in the longitudinal direction of the rigid pipe, as opposed to the radial dimensions, such as the separation between the external surface of the internal wall and the internal surface of the external wall, the said separation defining the annular space provided between the said internal and external walls.

Depending on the nature of the curable compound used, a one-component or two-component compound, the curing time may be long or short according to the requirements. It is possible to select a resin and a hardener which are such that the curing of the curable compound is complete in a predetermined region before the same compound is introduced into another predetermined region.

Another advantage is that the buckle propagation arrestor is very simple to produce and does not require substantial means and that the curable compounds that can be used are sufficiently numerous to allow the best choice, which depends especially on the desired curing time.

Another advantage is that the number of predetermined regions filled with curable compound may be relatively large without creating any impediment to the winding of the rigid pipe onto the receiving reel or reels.

Another advantage is that the curable compound constitutes, by its nature, a good thermal insulation at the predetermined regions.

According to another characteristic of the invention, the sealing blocks each consist of a radially deformable material which may consist, in one embodiment, of a set of components that can deform individually in the radial direction, each component being able, for example, to have the shape of a washer or of a chevron.

Another advantage is that the at least radial deformation of each sealing block allows it to match the various local irregularities in the internal surface of the outer wall and therefore to adapt to the manufacturing tolerances on the outer wall.

According to another characteristic of the invention, the sealing blocks bear via one of their lateral faces on a bearing plate which is, for example, welded to the external surface of the internal wall, a gap being provided between the free edge of the bearing

plate and the internal surface of the outer wall. Consequently, after installation of the sealing blocks, introduction of the curable compound between two consecutive bearing plates, which thus define a predetermined region filled with the curable compound, and then radial deformation of the sealing blocks, a seal is also produced which seals against water or another liquid should either water or another liquid get into the annular space. This is because the curable compound, after it has cured, fills the said gap by pressing against the expanded blocks.

Another advantage resides in the fact that the curable compound may be injected into the rigid pipe either on land, when the pot life is long enough for the curing not to take place before use on the operating site, or directly on the pipelaying ship, activation means being provided on the pipelaying vessel in order to allow complete or partial curing of the curable compound.

Further advantages and features will become more clearly apparent on reading the description of several embodiments of the invention, as well as from the appended drawings in which:

- Figure 1 is a cross-sectional view of a portion of a section of a double-walled rigid pipe;
- Figure 2 is a schematic view of the joining of sections of the rigid pipe with two welds;
- Figure 3 is another schematic view of the joining of sections of the rigid pipe with four welds;
- Figure 4 is a perspective view of part of the means with which the pipelaying vessel is equipped, these being used in one particular implementation of the method according to the invention.

The double-walled rigid pipe 1 of longitudinal axis A, shown partially in Figure 1, comprises an inner wall or inner pipe 2 (flow pipe), the diameter and the nature of the material of which are chosen according to the fluid flowing in the said inner pipe, especially depending on the temperature and pressure of the said

fluid, and an outer wall or outer pipe 3 (carrier pipe) which is slipped over the inner pipe 2. The outer pipe 3 generally has an outside diameter D which is oversized with respect to the inner pipe 2 in order to allow a thermal insulation to be placed in the annular space 5 and represents a thickness allowing the hydrostatic pressure that is exerted on the said outer pipe 3 to be withstood. The rigid pipe 1 generally includes spacers or separators (not shown) which are fastened to the external surface 4 of the inner pipe 2 and which are lodged in the annular space 5 provided between the outer pipe 3 and the inner pipe 2.

According to the invention, a curable compound 6 is placed in predetermined regions 7 of the rigid pipe 1. Each predetermined region 7 has a given axial length L, which region is, for example, bounded by two sealing blocks 9 which are each in sealed and tight contact via their radially opposed faces 9′, 9′′ with the internal surface 3′ and external surface 4 of the pipes 3 and 2, respectively. The axial length L of each predetermined region 7, between two consecutive sealing blocks, is at least equal to 0.5 times the outside diameter D of the outer pipe 3 and it preferably ranges between 0.5 times and twice the said diameter D, when the compound is cured on land and before winding onto a reel on the pipelaying vessel. The calculations and tests carried out with various types of curable compounds 6 have shown that a length L lying within the limits indicated above were satisfactory; preferably, the upper limit is equal to the diameter D. In fact, the length L depends also and especially on the operating conditions of the rigid pipe 1. It is obvious that when the rigid pipe is very long, there will be many predetermined regions 7. Likewise, when the operating conditions are such that the depth of the sea between the pipelaying vessel and the seabed is great, it will be necessary to define the number and the length of the predetermined regions 7 so as to prevent propagation of a buckle, should it occur, even after a

portion of the rigid pipe has been finally laid on the seabed.

In a preferred embodiment of the invention, each sealing block 9 is made in one or more radially deformable materials, as will be explained in detail below. Radially deformable sealing blocks 9 have several advantages. A first advantage is that they each have a radial dimension, between the opposed faces 9′ and 9′′, which is less than the inside diameter d of the outer pipe 3 so that, after deformation, the radially opposed faces 9′ and 9′′ are in sealed and tight contact with the internal surface 3′ and the external surface 4. In addition, the tight contacting with the internal surface 3′ makes it possible to absorb any surface irregularities that the said internal surface 3′ might have, these being due especially to the manufacturing tolerances on the outer pipe 3.

Each block 9 may consist of a set of individually deformable components 10 which are placed in the form of a stack in the axial direction A, or are imbricated in one another, such as, for example, when each component 10 is in the form of a chevron 11, the tip of the chevrons being directed in the direction A.

In another embodiment, also shown in Figure 1, each block 9 bears, via one of its lateral faces 12, against a bearing plate 13 whose radial dimension or radius measured from the longitudinal axis A is less than the internal radius of the outer pipe 3, so that a gap I is left between the free edge 14 of the bearing plate 13 and the internal surface 3′ of the outer pipe 3, the internal radial face of each bearing plate 13 being welded to the external surface 4 of the inner pipe 2.

According to a first way of implementing the method according to the invention, shown in Figure 2, a section of inner pipe 2 is taken and the sealing block furthest to the right and, if necessary, the bearing plates 13 are positioned, as are the various components

which have to be lodged in the annular space 5, such as the spacers, the thermal insulation, etc. Next, a section of outer pipe 3 is slipped over the inner pipe 2 so that that region of the inner pipe where the sealing blocks are located is covered last, the section of outer pipe being slipped in the opposite direction so as not to damage the sealing blocks.

In another step, the internal pipes of two sections of double-walled pipe are welded together and then the section of outer pipe is slid along until it comes into contact with the other section of outer pipe and the two sections are welded together. The welds between the inner and outer pipes are depicted by the reference numbers 16 and 15, respectively; thus, a two-weld method is employed.

In another step, the internal block or the one furthest to the right in Figure 1 is radially deformed and the other sealing block 9 furthest to the left is positioned; the curable compound is then introduced or injected in a sufficient amount into the predetermined region 7 and the sealing block furthest to the left is radially deformed.

Figure 3 shows a four-weld method. After having taken a section of internal pipe 2 and welded two bearing plates 13 separated by a given distance, a section of outer pipe 3 shorter than the section of internal pipe is slipped on. An expandable block 9 is introduced via one end of the short section of outer pipe, this expandable block then being compressed axially in order to produce a radial deformation and therefore a tight contact with the internal surface of the short section of pipe. Next, the desired amount of curable compound is introduced and then the second block 9 is introduced via the other end of the short section of pipe, and the said second block is deformed radially. The welding steps will consist in welding the section of internal pipe to the other two sections, the two welds being depicted by the regions or gaps 18 and 19, and then in welding the short section of outer pipe

to the other two longer sections of outer pipe, the two welds being depicted by the reference numbers 20 and 21.

In some cases, the curable compound may include air, a situation which is not desirable because of the weakening of the buckle arrestor device 1 that it may cause. It is possible to expel the air from the curable compound if bearing plates are not used and if the curable compound is compressed by means of the blocks 9, the air expelled during compression being removed via the interstice or vent that exists between the upper face of at least one block and the internal surface of the outer pipe, while the said blocks in the rest state are undeformed. After deformation, a complete seal is obtained which even seals against water or against any other liquid which might get into the annular space.

Another way of implementing the method according to the invention consists in providing, in line with each predetermined region 7, at least one orifice 22 through which the curable compound 6 is injected under pressure into the predetermined region 7. After the latter has been filled, the orifice or orifices 22 are sealed off. Under these conditions, the curable compound 6, which is free of air, is introduced into the gaps I left between the free edge 14 of the bearing plates 13 and the internal surface 3′ and comes into contact with the sealing blocks which are in the undeformed state. After the curable compound has cured, an excellent seal with respect to any foreign body, solid or fluid, which might flow in the annular space 5 is also obtained. Preferably, two orifices 22 and 22′ are provided in each predetermined region 7, the orifice 22 being provided in the bottom and the orifice 22′ in the top. The curable compound is injected under pressure into the predetermined region 7 until a small quantity of it runs out via the radially opposed orifice 22′. After the predetermined region 7 has been

completely filled, the orifices 22 and 22' are then sealed off.

Although it is possible to use as curable compound a one-component compound whose pot life is relatively long, it is preferable to use a two-component compound, the resin and the hardener of which are mixed in a filling head before it is introduced into the predetermined regions 7 and the pot life of which, at room temperature, is a few minutes. Among one-component compounds, mention may be made of MS 703-25 from Engineering Materials Systems Inc. Among two-component compounds that can be used, mention may be made by way of example of ARALDITE 2012 (AW 2104/HW 2934) sold by Ciba-Geigy. The curing time may be adjusted by varying the temperature at which the mixture is injected into each predetermined region 7.

In another embodiment, the rigid pipe 1 is transported, wound up on the operating site with the predetermined regions 7 empty or devoid of any curable compound. On the operating site, the predetermined regions 7 of the rigid pipe are filled with a one-component compound having a short pot life, of a few minutes to a few hours, and, in order to accelerate the curing, heating means, as shown in Figure 4, may be used. The filling of the predetermined regions 7 may be carried out either after the rigid pipe 1 has been unreeled from the receiving reel but before it has passed through straighteners 24 which are provided along the path of the rigid pipe, when the reaction time of the components of the compound is long enough, or after the said straighteners 24. When the two components of the compound react together rapidly, in order to allow the compound to cure, it is not necessary to use additional means to obtain the desired curing unless it is wished to accelerate the curing. When it is necessary or desirable to accelerate the curing, so as to reduce the stoppage time when laying the rigid pipe, heating means 23 may be provided on the path along which the rigid pipe runs between the

straighteners and the heating means 23 so that the curing has taken place at least partially before the rigid pipe leaves the pipelaying vessel. In a preferred embodiment of the invention, the heating means 23 are provided near the bottom end of a pipelaying ramp 25 mounted on the pipelaying vessel and the predetermined regions 7 are filled after they have passed through the straighteners 24, while the rigid pipe is straight. The two-component compound used, which is a thermosetting compound, may consist of ARALDITE AY 105-1/HY 991 sold by Ciba-Geigy.

A compound not requiring heating means may consist of ARALDITE 2012 (AW 2104/HW2934) sold by Ciba-Geigy.

Advantageously, if the curable compound is not rigid enough in the cured state, it is possible to insert, during manufacture of the rigid pipe 1, a reinforcement in one or more of the regions 7. The reinforcement may consist of fibres, fabrics or mats, a spring placed around the inner pipe 2, a metal mesh, etc. Consequently, the region or regions 7 will be filled with a composite consisting of the reinforcement and the curable compound.

It is also possible to use a one-component curable compound whose pot life is relatively long, for example of the order of a few weeks. Such a curable compound may be injected into the predetermined regions 7 on land, during manufacture of the rigid pipe 1, the latter then being transported to the pipelaying vessel where it is wound onto one or more receiving reels. Since the curable compound is in the uncrosslinked state, it is flexible, which allows the rigid pipe to be wound onto the receiving reel or reels until the pipelaying vessel reaches the operating site.

It is then necessary to cure the compound before the rigid pipe is immersed in the water. In this case, in a laying step after the rigid pipe has been unreeled from the reel onto which it was wound, the rigid pipe 1 goes past or through appropriate means for

activating and curing the compound injected into each predetermined region 7. The appropriate means may consist, for example, of suitable well-known heating means which initiate the crosslinking or curing of the one-component compound. The one-component compound is cured in a place where the rigid pipe is linear and when the rigid pipe leaves the pipelaying vessel to be immersed in the water.

We Claim:

1. A method of producing a device for arresting the propagation of a buckle in a rigid pipe (1) comprising an outer wall (3) having a defined external diameter (D) and placed around an inner wall (2), an annular space (5) being provided between said outer (3) and inner (2) walls, which consists in providing predetermined regions (7) in said annular space (5), each predetermined region (7) being bounded between two sealing blocks (9) whose radially opposed faces are in contact with the outer (3) and inner (2) pipes, and in placing a curable compound (6) in each predetermined region (7), the length (L) of each predetermined region (7) being at least equal to 0.5 times the external diameter (D) of the outer wall (3).

2. The method as claimed in claim 1, wherein the curable compound (6) is introduced and cured before said rigid pipe (1) is wound.

3. The method as claimed in claim 2, wherein the length (L) of each predetermined region (7) ranges between 0.5 and 2 times the external diameter (D) of the outer wall (3).

4. The method as claimed in claim 1, wherein the sealing blocks (9) each consist of a radially deformable material.

5. The method as claimed in claim 4, wherein each sealing block (9) bears via at least one lateral side against a rigid bearing plate (13).

6. The method as claimed in claim 7, wherein the bearing plate (13) has a radial dimension less than the radial dimension of the annular space (5).

7. The method as claimed in claim 6, wherein the bearing plate (13) is made of metal and is fastened to the outer surface (4) of the inner wall (2), so as to leave a gap (I) between the free edge (14) of said bearing plate (13) and the inner surface (3') of the outer wall (3).

8. The method as claimed in one of claims 2 to 5, wherein each sealing block (9) made of radially

deformable material has a radial dimension less than the annular space (5) when it is introduced into said rigid pipe and it then undergoes radial expansion in order to bring the radially opposed faces into tight contact with the facing surfaces of the outer and inner walls.

9. The method as claimed in claim 1, wherein the curable compound (6) is an epoxy resin.

10. The method as claimed in one of claims 1 to 3 or 9, wherein the curable compound (6) is injected into each predetermined region through at least one orifice (22) provided in the outer wall (3).

11. The method as claimed in claim 10, wherein the compound (6) is a thermosetting compound.

12. The method as claimed in claim 10, wherein the compound (6) is curable at room temperature.

13. The method as claimed in claim 11, wherein the thermosetting compound (6) is introduced into the predetermined regions (7) after the rigid pipe has been unreeled from a reel onto which it had been previously wound and each predetermined region (7) passes through heating means (23) in order to accelerate the curing of the thermosetting compound.

14. The method as claimed in claim 13, wherein the heating means (23) are mounted after straighteners (24) provided on a pipelaying vessel and between which means and which straighteners the rigid pipe runs.

15. The method as claimed in claim 1, wherein the pot life of the curable compound ranges between a few minutes and a few weeks.

16. The method as claimed in claim 1, wherein the curable compound is introduced into the predetermined regions (7) on land, before winding onto a receiving reel located on the pipelaying vessel and before transportation to the site.

17. The method as claimed in claim 14, wherein the curable compound (6) is injected into the predetermined regions (7) after the straighteners (24).

ABSTRACT

Device for arresting the propagation of a buckle in a double-walled pipe (1).

The said device comprises an outer wall (3) having a defined external diameter (D) and placed around an inner wall (2), an annular space (5) being provided between the said outer and inner walls, and it is characterized in that it consists in providing predetermined regions (7) in the said annular space (5), each predetermined region (7) being bounded between two sealing blocks (9), the radially opposed faces of which are in contact with the outer and inner pipes, in placing a curable compound (6) in each predetermined region (7), the length (L) of each predetermined region (7) being at least equal to 0.5 times the external diameter (D) of the outer wall (3).

Figure 1

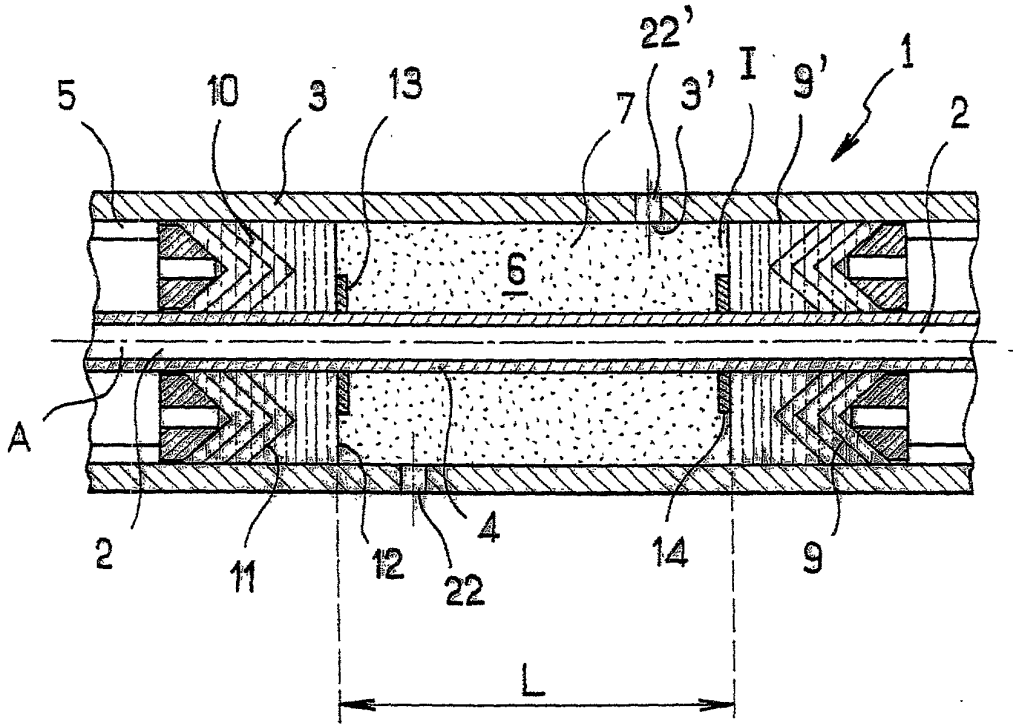

FIG_1

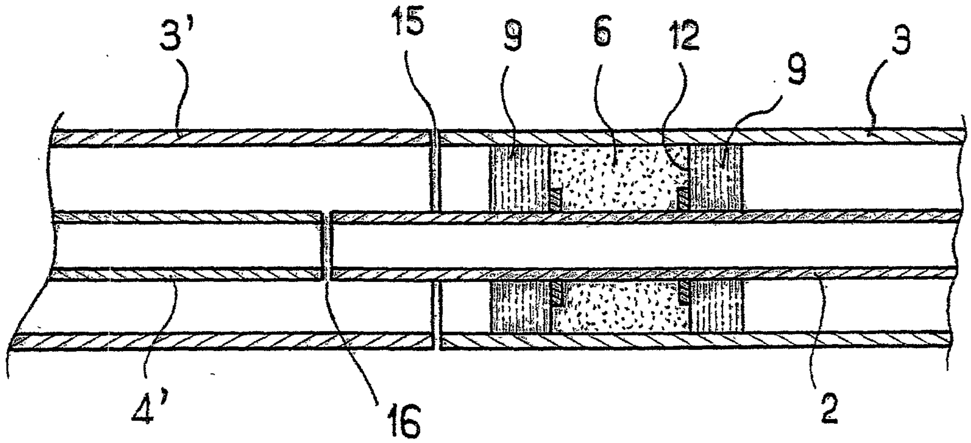

FIG_2

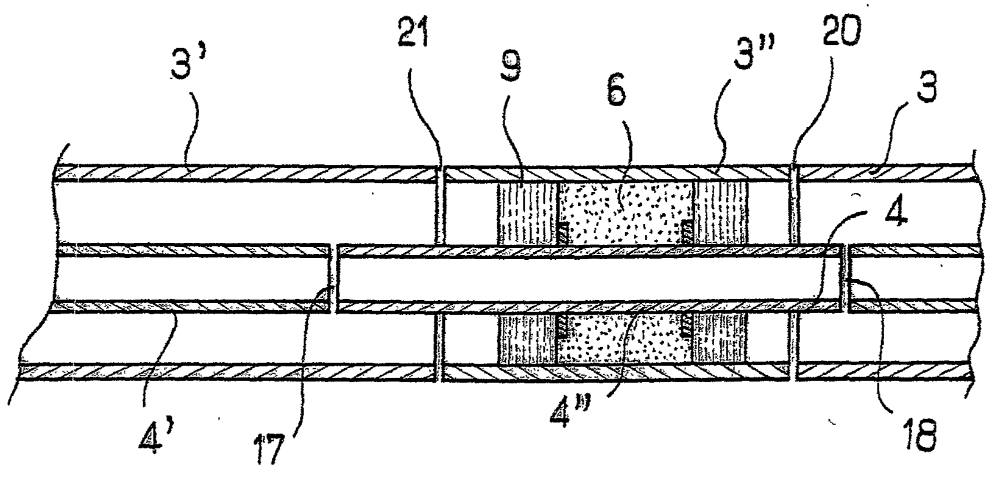

FIG_3

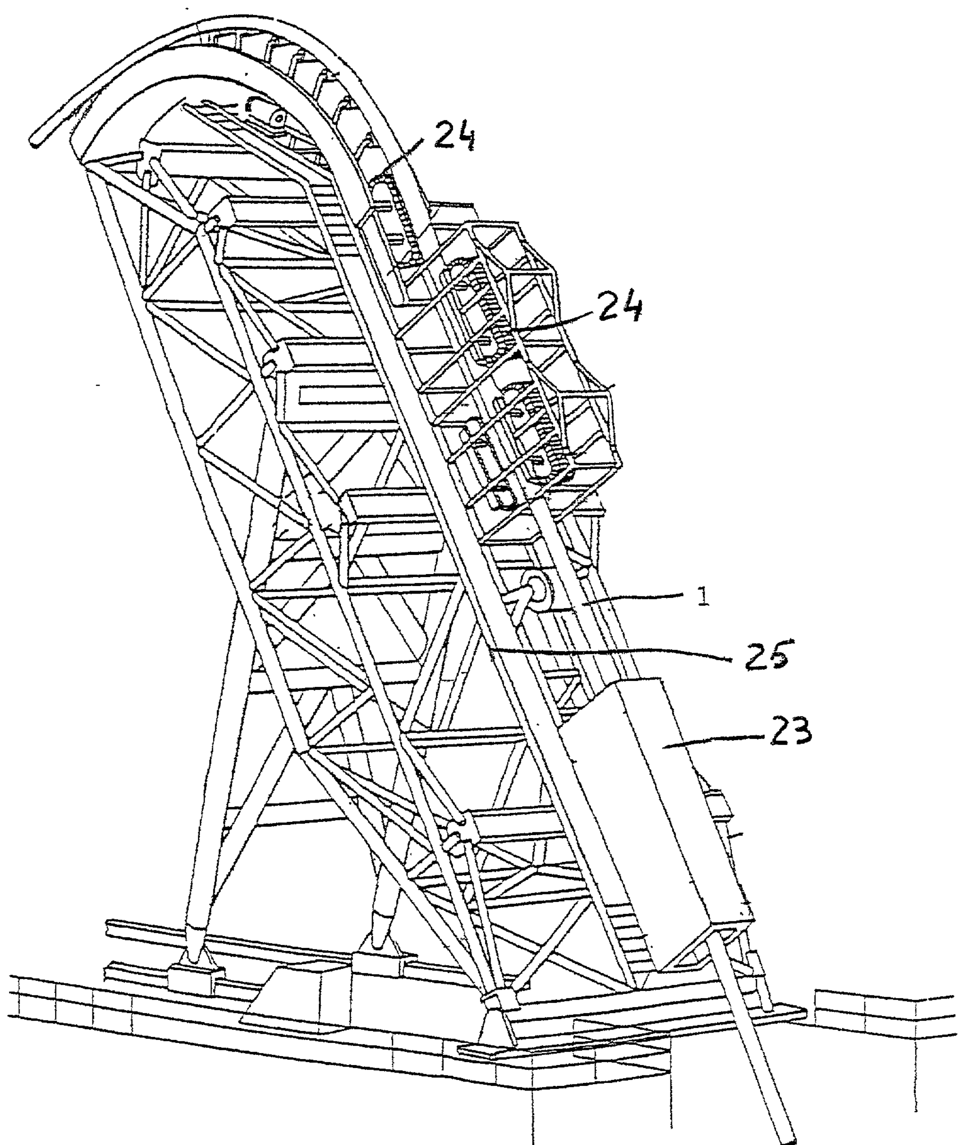

FIG 4

UNITED STATES OF AMERICA
COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

OFGS FILE NO. 0/3255-43

As a below named inventor, I hereby declare that: my residence, post office address and citizenship are as stated below next to my name; that I verily believe that I am the original, first and sole inventor (if only one name is listed below) or a joint inventor (if plural inventors are named) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Device for arresting the propagation of a buckle in a double-walled pipe.

the specification of which is attached hereto, unless the following box is checked:

☐ was filed on _____ as United States patent Application Number or PCT International patent application number _____ and was amended on _____ (if any).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information known to be material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim priority benefits under Title 35, United States Code §119 of any foreign application(s) for patent or inventor's certificate or United States provisional application(s) listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign or Provisional Application(s)

COUNTRY	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 U.S.C. 119
FRANCE	99 08 539	02/07/99	YES X NO ___
FRANCE	99 15 216	02/12/99	YES X NO ___
			YES ___ NO ___

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, §1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

UNITED STATES APPLICATION NUMBER	DATE OF FILING (day month year)	STATUS (patented, pending, abandoned)

I hereby appoint customer no. 2352 OSTROLENK, FABER, GERB & SOFFEN, LLP, and the members of the firm, Samuel H. Weiner - Reg. No. 18,510; Jerome M. Berliner - Reg. No. 18,653; Robert C. Faber - Reg. No. 24,322; Edward A. Meilman - Reg. No. 24,735; Stanley H. Lieberstein - Reg. No. 22,400; Steven I. Weisburd - Reg. No. 27,409; Max Moskowitz - Reg. No. 30,576; Stephen A. Soffen - Reg. No. 31,063; James A. Finder - Reg. No. 30,173; William O. Gray, III - Reg. No. 30,944; Louis C. Dujmich - Reg. No. 30,625 and Douglas A. Miro - Reg. No. 31,643, as attorneys with full power of substitution and revocation to prosecute this application, to transact all business in the Patent & Trademark Office connected therewith and to receive all correspondence.

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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